

CELLS

Cell =

- Smallest, organized unit of living organisms



Important People

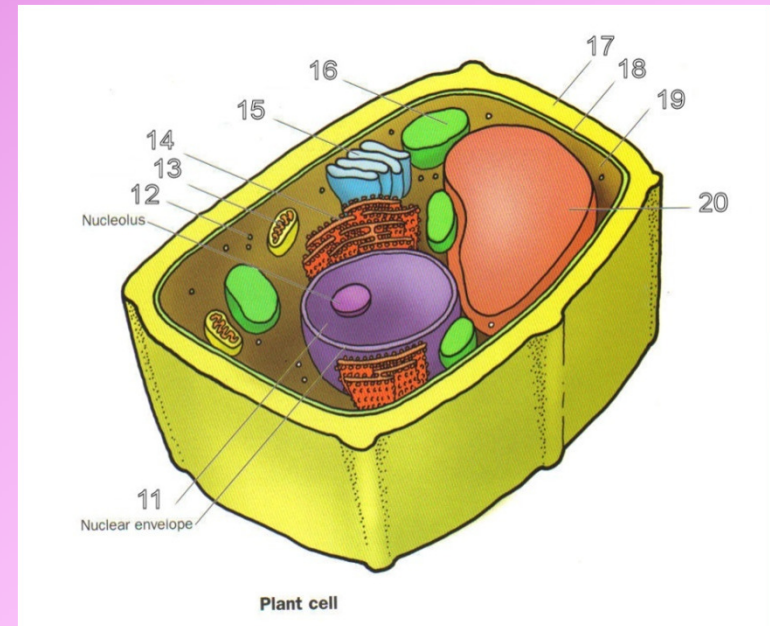
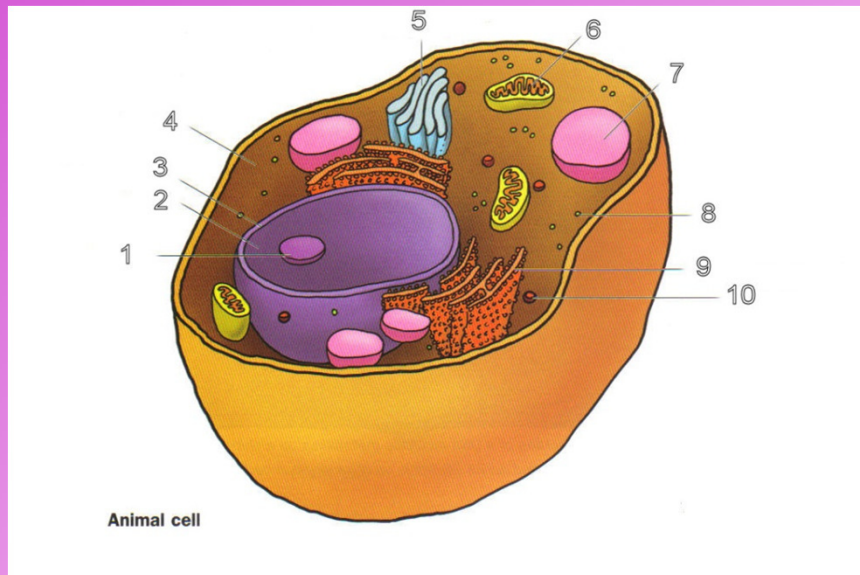
- Leeuwenhoek
 - 1600s
 - First person to use a microscope to view living things
- Hooke
 - 1600s
 - Coined the term “cells” when looking at cork
- Schwann, Brown, Schleiden, Virchow
 - 1800s
 - Each contributed to the cell theory

Cell Theory

- A • All living things are composed of cells
- B • Cells are the building blocks of living things
- C • All cells come from preexisting cells by cell division

Organelle =

- “Little organ”
- Small structure that performs a specialized function within the cell



ORGANELLES

- **Cell wall** (walls of room)
 - Gives cell support and box-like shape
 - Found only in PLANT cells
- **Cell membrane** (lock)
 - Controls what enters and leaves the cell
 - “Gatekeeper”
 - Found in plant AND animal cells

- **Cytoplasm** (jelly)
 - Jelly-like fluid between cell membrane and other organelles, holding them in place
 - Found in plant AND animal cells
- **Nucleus** (brain)
 - “Brain” or control center of the cell
 - Chromosomes (contain hereditary info) are here
 - Found in plant AND animal cells

- **Mitochondria** (football)
 - “Powerhouse”
 - Creates energy during cell respiration
 - Found in plant AND animal cells
- **Ribosomes** (golf balls)
 - Where proteins are built
 - Found in plant AND animal cells

- **Endoplasmic reticulum or ER** (cars, golf balls)
 - Network of channels that transports and stores proteins
 - Rough er
 - Has ribosomes
 - Smooth er
 - No ribosomes
 - Found in both plant AND animal cells
- **Golgi body or apparatus** (gift bag)
 - Changes, packages, and releases proteins
 - Found in both plant AND animal cells

- **Vacuole** (large and small water bottles)
 - Stores water
 - BIGGER in plant cells than animal cells
- **Chloroplast** (yellow/green tennis ball)
 - Converts sunlight to food (glucose)
 - Found only in PLANT cells

- **Lysosome** (sponge/Lysol)
 - Contains digestive enzymes to clean up the cell
 - Found only in ANIMAL cells
- **Centriole** (kite string)
 - Forms spindle fibers to separate chromosomes during cell division
 - Found only in ANIMAL cells

GENETICS

Gregor Mendel

- Monk who studied math and science
- Famous for contributions in genetics

Genetics =

- Study of heredity

Heredity =

- Biological inheritance of traits from parent to offspring

Gene =

- Unit by which hereditary characteristics are transmitted

Allele =

- Different forms of a gene
 - Offspring get one allele from each parent

- Examples
 - Gene for height (tall versus short)
 - 2 Tall alleles = Tall
 - 2 Short alleles = Short
 - 1 Tall allele + 1 Short allele = Tall
 - Gene for seed color (yellow versus green)
 - 2 Yellow alleles = Yellow
 - 2 Green alleles = Green
 - 1 Yellow allele + 1 Green allele = Yellow

Dominant allele =

- Form of a gene that is expressed when present and masks the recessive form
- Represented with a capital letter
- Examples
 - Tall plant
 - Yellow seed color

Recessive allele =

- Form of a gene that is not expressed if dominant allele is also present
- Represented with a lowercase letter
- Examples
 - Short plant
 - Green seed color

Phenotype =

- **Ph**ysical expression of a trait in an organism
- IE- What you “see”
- Examples
 - Tall or short
 - Yellow or green seed
 - Blue or brown eyes

Genotype =

- Genetic make up of an organism
- Examples
 - TT, Tt, tt
 - YY, Yy, yy
- NOTE: Phenotypes can be produced by more than one genotype
 - TT and Tt both = tall
 - YY and Yy both = yellow seeds

Homozygous =

- Organism with identical pair of alleles for a trait
 - Either both dominant or both recessive alleles
- “Same” “Joined together”
- Examples
 - TT, tt, YY, yy

Heterozygous =

- Organism with mixed pair of alleles for a trait
 - One dominant and one recessive allele
- “Different” “Joined together”
- Examples
 - Tt, Yy

PRACTICE EXAMPLES

Tall (T) is dominant over short (t)

Axial (A) is dominant over terminal (a)

Purple flowers (P) is dominant over white (p)

Write the phenotype for each.

Tt	tall
aa	terminal
PP	purple
TTpp	Tall AND white
AaPp	Axial AND purple

Tall (T) is dominant over short (t)

Axial (A) is dominant over terminal (a)

Purple flowers (P) is dominant over white (p)

Write the genotype for each.

Homozygous axial

AA

Short

tt

Heterozygous purple

Pp

Heterozygous tall AND terminal

Ttaa

Homozygous tall AND homozygous purple

TTPP

Trait	Dominant Allele	Recessive Allele
Homozygous	Genotype(s)	
	Phenotype(s)	
Heterozygous	Genotype(s)	
	Phenotype(s)	

Punnett Square Practice

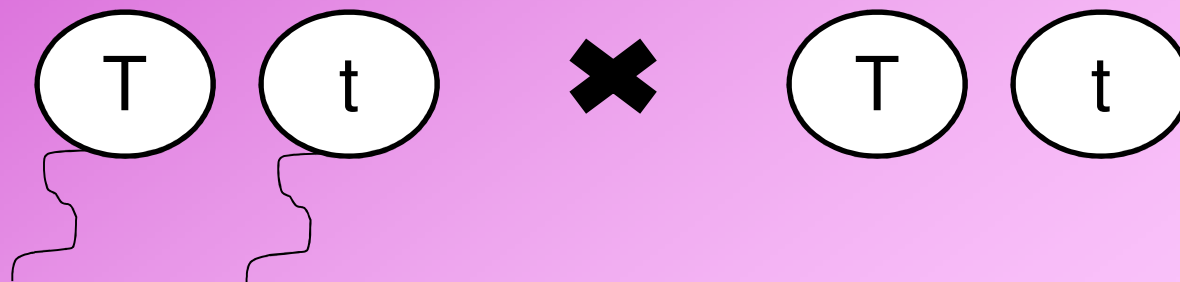
- **Punnett square** =
 - A chart used to display the potential genotypes of offspring from a particular male and female parent

1. Write the genotype of the parents of the cross using the correct symbols.

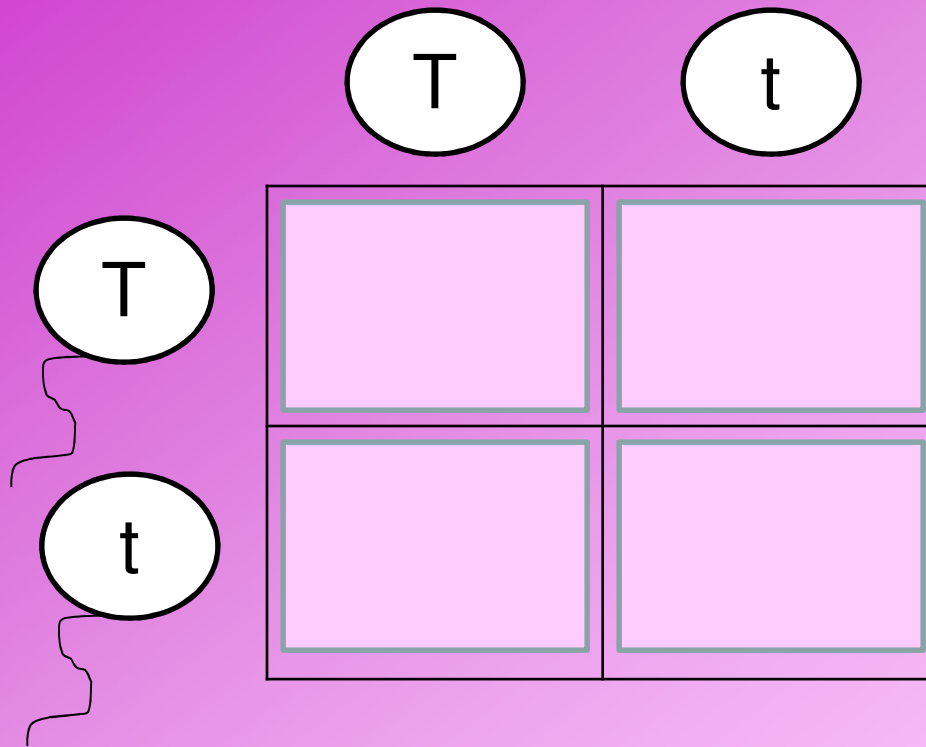
EX: Cross 2 heterozygous tall plants

♂ Tt X Tt ♀

2. Segregate the alleles of each gene on separate gametes. This allows you to determine all the gene combinations possible in the egg and sperm cells.



3. Set up the Punnett square correctly.



4. Determine the probability of having an offspring of each genotype and phenotype.

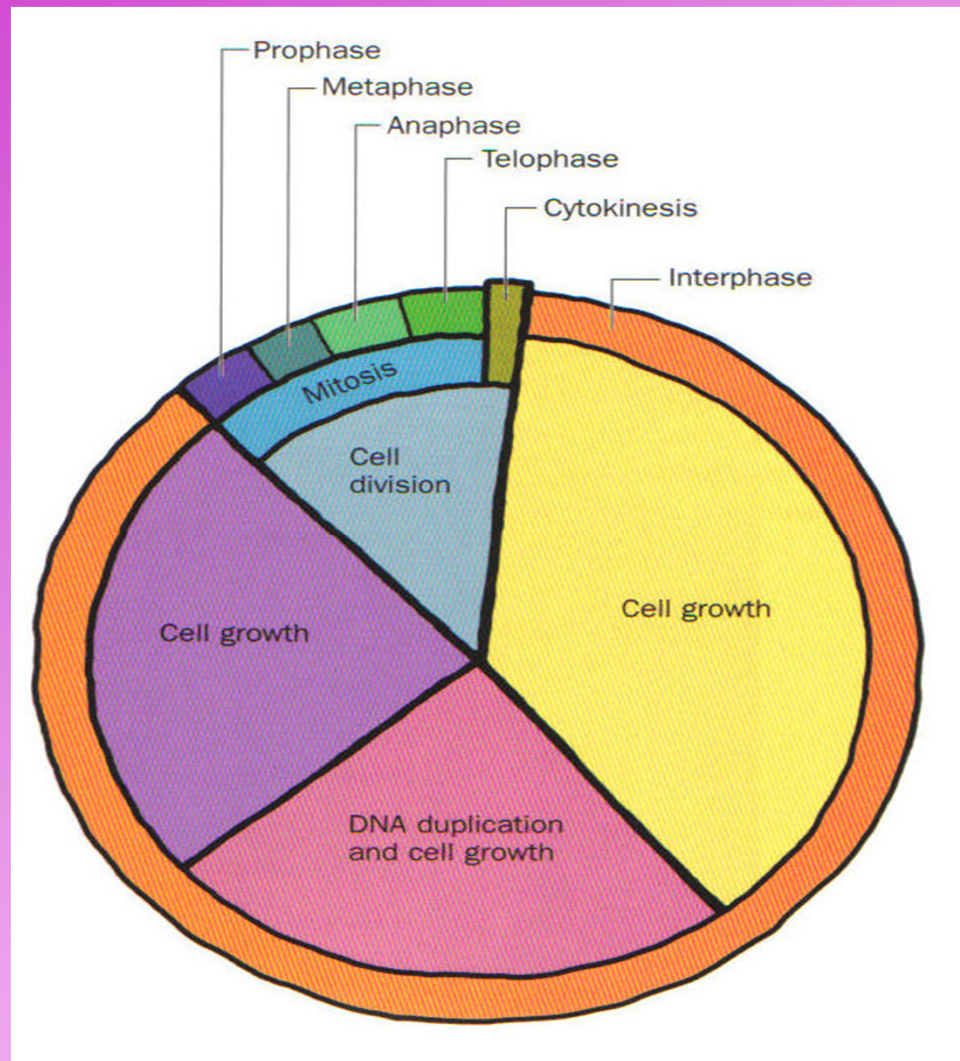
- Probability offspring has genotype TT: $1/4$
- Probability offspring has genotype Tt: $2/4 = 1/2$
- Probability offspring has genotype tt: $1/4$
- Probability offspring is tall: $3/4$
- Probability offspring is short: $1/4$

CELL DIVISION

- In most animals and plants, cells increase in size and then divide into 2 cells
- Those cells increase in size and divide again
- Cell cycle =
 - Period of time from the beginning of one cell division to the beginning of the next
 - The purpose of the cell cycle is:
 - To **MAKE MORE IDENTICAL CELLS!**

- Length of cell cycle varies
 - Average length is 20 hours
 - Cells of embryo divide every 30 minutes
 - 2 types of cell do NOT divide at all after they have developed
 - Muscle
 - Nerve

CELL CYCLE DIAGRAM



Interphase =

- Collective name for G_1 , S, G_2 phases
 - During **G_1 and G_2** phases:
 - » Cell growth
 - During the **S phase**:
 - » Chromosomes are copied

Mitosis =

- Process during which the cell's nucleus divides, and 2 genetically identical nuclei result
- **M phase** of the cell cycle
- Divided into 4 phases
 1. Prophase
 2. Metaphase
 3. Anaphase
 4. Telophase

Cytokinesis =

- Division of cytoplasm
- Different in plant and animal cells
 - Plants - cell plate forms in middle and becomes cell wall

CELL ORGANIZATION

Sometimes groups of cells work together to accomplish a task

- **Cell** =

- Smallest organized unit of living organisms
 - Human Examples: blood, skin, bone

- **Tissue** =

- Mass of similar cells that performs a specific function
 - Human Examples: epithelial, connective, nerve, muscle

- **Organ** =

- Group of tissues that work together to perform a specific function

- Human Examples: eye, heart, lungs, stomach, intestines

- **Organ System** =

- Groups of organs that perform several closely related functions

- Human Examples: skeletal, muscular, digestive, nervous, immune, circulatory, respiratory

- Thick fur (T) is dominant over thin fur (t)
- Rosy cheeks (R) are dominant over pale (r)
- Long tail (L) is dominant over short (l)